the DEMS interference problem, DirecTV's prospects for being able to use the 24 GHz spectrum would have been highly speculative.

57. Because the Government allocation was deleted from this band following the Relocation Order, the Commission now has flexibility to allocate and assign spectrum in this band which it did not have before the Relocation Order. While that spectrum has been assigned to relocated DEMS stations in approximately thirty markets, we can now make further assignments to DEMS in the 24 GHz band throughout the rest of the country. Consequently, we expect to release a notice of proposed rulemaking later this year soliciting comment on service and licensing rules for the 24 GHz band. Although DirecTV raises concerns that it will not be able to share the 24 GHz spectrum with DEMS, the DEMS licensees and DirecTV have both submitted technical analyses indicating that sharing should be feasible.[113] Sharing by licensees of DEMS facilities and BSS "gateway" feederlinks of the kind proposed by DirecTV should be possible. Because the gateway facilities are few, not ubiquitously deployed, and need not be located near major population centers, it should be possible to design the facilities to minimize interference to fixed services operating on the same frequencies. Thus, the allocation of 24 GHz spectrum to DEMS licensees does not necessarily foreclose implementation of DirecTV's proposal. Although the DEMS licensees and DirecTV differ on the precise terms of the sharing and both FS and potential BSS operators may face system design constraints, these technical issues can be addressed in appropriate future proceedings.

E. Auction Requirement

58. BellSouth argues that under Section 309 (j) of the Act, the Commission should have assigned DEMS licensees the same amount of spectrum in the 24 GHz band that they were assigned at 18 GHz, and conducted a competitive bidding procedure for the additional 24 GHz spectrum.[114] Similarly, WebCel asserts that if DEMS operations at 24 GHz require additional spectrum, the Relocation Order should have addressed whether requiring DEMS licensees to compete for that spectrum in an auction is "warranted or mandated under Section 309(j)."[115] The DEMS licensees respond that they are incumbent licensees and applicants, not new entrants who may be required to obtain spectrum in an auction.[116]

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[113] *See* DirecTV's "Technical Response to Teligent DEMS/BSS Interference Analysis and Proposed Solution," dated August 27, 1997, submitted with ex parte filing; letter dated from Antoinette Cook Bush and Jay L. Birnbaum to John P. Janka and James H. Barker re "Analysis of DEMS/BSS Interference in the 25.05-25.25 GHz Band" September 23, 1997.

[114] BellSouth petition at 19. BellSouth does not indicate whether it believes that the 24 GHz spectrum should have been auctioned only for DEMS use or for other services as well.

[115] WebCel petition at 18.

[116] DEMS Licensee's joint opposition at 27.

59. The Commission modified the licenses previously granted to DEMS licensees pursuant to Section 316 of the Act. As discussed above,[117] it assigned DEMS licensees only enough spectrum in the 24 GHz band to permit them to replicate their operations in that band using similar facilities, transmission rates, and power to achieve the same capacity and reliability, given the different propagation characteristics in the two frequency bands. Because its actions were license modifications under authority of Section 316, and did not involve the grant of initial licenses, the Commission was not authorized under Section 309(j) of the Act to use auction procedures. Those auction procedures may only be used to select from among mutually exclusive applications for initial licenses.[118] Accordingly, petitioners' reliance on Section 309(j) of the Act is misplaced.

F. De Facto Monopoly

60. MWCA asserts that the Relocation Order reduces the number of available DEMS channels by 50 percent from 10 to five, resulting in a de facto monopoly over all available DEMS spectrum.[119] MWCA argues that the Commission should have considered this impact on competition in a rulemaking proceeding. The DEMS licensees counter that nothing in the Relocation Order changes the fundamental character of DEMS.[120] We agree. MWCA's assertion that there were ten channels available for commercial DEMS in the 18 GHz band is incorrect. In fact, there were only five transmit/receive DEMS channels available for assignment for commercial point-to-multipoint transmission at 18 GHz[121] and there are five at 24 GHz. The Commission's actions in the Relocation Order simply changed the frequency bands in which DEMS operators operate. Thus, there is no basis for MWCA's claim that the Relocation Order altered the competitive status quo.

IV. OTHER MATTERS

61. At the time of the Relocation Order, the only operations in the 24 GHz band in the United States were two radionavigation radar facilities operated by the Federal Aviation

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[117] *See* Section III.C. *supra*.

[118] At the time of the Relocation Order, Section 309 (j) of the Communications Act stated: "If mutually exclusive applications are accepted for filing for any *initial license or construction permit* which will involve a use of the electromagnetic spectrum . . . then the Commission shall have the authority . . . to grant such license or permit to a qualified applicant through the use of a system of competitive bidding . . . ." 47 U.S.C. § 309 (j) (emphasis added). Section 309 was recently amended to require, rather than authorize, the use of competitive bidding for certain initial licenses. Because auction procedures still apply only to initial licenses, that change in the statute does not affect our decision.

[119] MWCA petition at 15.

[120] DEMS licensees' opposition at 34.

[121] *See* 47 C.F.R. § 101.505 (1996).

Administration.[122] The facilities, located near Washington, D.C. and Newark, New Jersey, were scheduled to be decommissioned January 1, 1998 and January 1, 2000, respectively. The Relocation Order added U.S. Footnote US341 to the U.S. Table of Allocations to protect the FAA operation in these two areas until decommissioning.[123] Consistent with this schedule, the facility in Washington, D.C. has been decommissioned and the decommissioning date for the Newark, New Jersey station has been advanced. In order to accurately reflect the current status we amend US341 to state:

> Non-Government operations in the 24.25-24.45 GHz band must provide protection to the FAA radionavigation radar facility at the Newark International Airport, New Jersey, until the facility is decommissioned. The Newark radar facility is scheduled to be decommissioned by January 1, 1998. Protection will be afforded in accordance with criteria developed by the NTIA and FCC.

V. CONCLUSION

62. We have carefully and comprehensively considered the arguments presented by the Petitioners and find them to be unpersuasive. Consequently, we deny the petitions for reconsideration and partial reconsideration of the Relocation Order and the petitions for reconsideration and applications for review of the Modification Order. We affirm the Commission's decision relocating DEMS from the 18 GHz band to the 24 GHz band based upon the requests made by NTIA on behalf of the Department of Defense and the Commission's objective of maintaining DEMS on a uniform nationwide frequency band.

V. ORDERING CLAUSES

63. Accordingly, IT IS ORDERED that the Petitions for Reconsideration of WebCel Communications, Inc., DirecTV Enterprises, Inc. and BellSouth Corporation of the March 14, 1997 Relocation Order ARE DENIED.

64. IT IS FURTHER ORDERED that the Petition for Partial Reconsideration filed by the Millimeter Wave Carrier Association, Inc. IS DENIED.

65. IT IS FURTHER ORDERED that the Petitions for Reconsideration of DirecTV Enterprises, Inc. and Bellsouth Corporation of the June 24, 1997 Modification Order ARE DENIED.

66. IT IS FURTHER ORDERED that the Applications for Review of WebCel Communications, Inc., and Millimeter Wave Carrier Association, Inc., of the June 24, 1997 Modification Order ARE DENIED.

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[122] Relocation Order at ¶ 15.

[123] *See* Relocation Order at Appendix A: Final Rules, Part 2.

67. IT IS FURTHER ORDERED that the Joint Motion for Leave to File Surreply of Digital Services Corporation, Microwave Services Inc. and Teligent, L.L.C., ET Docket No. 97-99, IS GRANTED and that WebCel Communications, Inc., Opposition to Joint Motion for Leave to File Surreply, ET Docket No. 97-99, IS DENIED.

68. IT IS FURTHER ORDERED that the Motion of WinStar Communications, Inc. to withdraw its Petition for Clarification and its Reply IS GRANTED.

69. IT IS FURTHER ORDERED that Teledesic Corporation's request to withdraw its Petition to Deny and Determine Status of Licenses, File No. 9607682 et. al., IS GRANTED.

70. IT IS FURTHER ORDERED that the Motions for Expedited Resolution filed by Millimeter Wave Carrier Association, Inc. and WebCel Communications, Inc., ET Docket No. 97-99, ARE DISMISSED.

71. IT IS FURTHER ORDERED that the U.S. Table of Allocations footnote US341 is amended as discussed above.

FEDERAL COMMUNICATIONS COMMISSION

Magalie Roman Salas

Magalie Roman Salas
Secretary

APPENDIX A

BANDWIDTH REQUIRED AT 24 GHz VERSUS REQUIREMENT AT 18 GHZ

In order to provide equivalent performance at 24 GHz as at 18 GHz without significant increase in equipment or system cost, a number of methods can be combined with presently available equipment to minimize equipment changes to those required only by the change in frequency. The need to overcome the additional signal degradation due to increased rain attenuation at 24 GHz leads to a different operational strategy than that used in the 18-GHz band. The main operational differences in this strategy are twofold: 1) a change in modulation scheme to one which is more robust but consequently requires additional bandwidth; and 2) a change in channel sharing techniques which requires less total transmitter power but again requires additional bandwidth.

A. ADDITIONAL LOSSES AT THE HIGHER FREQUENCY BAND

The main difference between the 18 and 24 GHz bands lies in the propagation effects. There are three main causes of reduced performance at the higher frequency band as summarized below:

Increased rain attenuation (0.01%, rain climate K)	9.5 dB
Increased spreading loss, 20 $\log(f/f_o)$	2.3 dB
Reduced amplifier output at higher band	1.0 dB
Total additional performances losses to be overcome	**12.8 dB**

The 9.5 dB rain attenuation differential is based on a typical cell radius of around 4.8 km and a service reliability of 99.99%. The 1.0 dB of reduced transmitter power is a result of operating the same power amplifier at the higher frequency. However, 2.3 dB of additional spreading loss can be counteracted by increasing antenna gain if the same antenna is used at the higher frequency band. This leaves a total of 10.5 dB which needs to be overcome. Increasing the transmitter power by this amount would overcome these additional losses, but would have required significant redesign of the existing DEMS equipment. Similarly, the DEMS cell size could be reduced, but that would significantly increase the number of cells required and therefore the cost of DEMS. Studies have shown that this performance could be recovered by reducing a typical cell diameter from 4.81 to 2.84 km. This represents a reduction in area by a factor of 2.8, with a consequently similar increase in the number of cells.

B. EQUIPMENT CAPABILITIES

DEMS equipment intended for operation at 18 GHz is capable of operating with different modulation techniques. One of these, 16-phase trellis code modulation (16-TCM) with Rate 3/4 forward error correction (FEC), is very efficient in bandwidth utilization and is

the one which would have been used at 18 GHz. Also available is quadriphase shift key (QPSK) with Rate 1/2 FEC. This latter modulation technique requires about 7 dB lower carrier-to-noise (C/N) ratio; however, it requires three times the bandwidth of the 16-TCM technique.

DEMS equipment for implementation at 18 GHz would also allow sharing of the bandwidth resource among the users by allowing the nodal station to change the bit rate of the customer station on a demand basis. This capability, known as dynamic bandwidth allocation (DBA), is accomplished by having the remote (customer) station capability to transmit simultaneously two different signals, one with a current bit rate and a second with the new bit rate. When the line-up of the new signal is complete, the service is switched to the new signal and the old signal is turned off by the nodal station. While this technique is efficient in sharing bandwidth among users, the requirement to support two simultaneous signal forces the power of the individual signals to be on average approximately 4 dB lower than what the transmitter is capable of supporting.

The improvement in bandwidth efficiency which results from the application of DBA is estimated to be a factor of 2.59, based on an average of six trunks per remote, an offered load of 0.2 Erlangs per trunk, call blocking capability of 0.1%, and the overhead needed to effect control of the DEMS remote station.

C. STRATEGY FOR HIGHER-FREQUENCY OPERATION WITH MINIMAL SYSTEM IMPACT

Based on current equipment capabilities, there are three different ways of operating the DEMS service within existing cells at the higher frequency band, with different relative efficiencies, depending on the distance from the nodal station.

Close to the nodal station, the service can be operated in the same manner as the entire service would have been operated at 18 GHz. In this region, out to 2.84 km from the nodal station, the service would operate at 16-TCM with DBA. The relative bandwidth requirement within this region, compared to the 18-GHz requirement, is 1.0.

Beyond this distance, the first level of compensation is to eliminate the DBA and operate in a fixed bandwidth allocation (FBA) mode. This approach, which can be sustained out to 3.75 km from the nodal station, requires 2.59 times the bandwidth which would be required when operating at 18 GHz.

Finally, beyond 3.75 km, out to the cell radius of 4.81 km, the modulation technique is changed to QPSK (3.0 bandwidth factor) and FBA is used (2.59 bandwidth factor); the bandwidth requirement is 7.77 times that at 18 GHz.

When the bandwidth factors of the three modes of operation are weighted according to the relative area of the cell within which each mode is feasible, the relative bandwidth factor,

averaged over the entire cell, for operation at 24 GHz compared to 18 GHz is 4.07. The table below summarizes these results.

Cell Region	Area (km^2)	Area Percent	Techniques	Bandwidth Factor	Weighted Bandwidth Factor
To 2.84 km	25.3	34.8	DBA & 16-TCM	1.0	0.35
2.84-3.75 km	18.8	25.9	FBA & 16-TCM	2.59	0.67
3.75-4.81 km	28.5	39.2	FBA & QPSK	7.77	3.05
				Total:	**4.07**